



## Books & Reports

### **Rover Wheel-Actuated Tool Interface**

A report describes an interface for utilizing some of the mobility features of a mobile robot for general-purpose manipulation of tools and other objects. The robot in question, now undergoing conceptual development for use on the Moon, is the All-Terrain Hex-Limbed Extra-Terrestrial Explorer (ATHLETE) rover, which is designed to roll over gentle terrain or walk over rough or steep terrain. Each leg of the robot is a six-degree-of-freedom general-purpose manipulator tipped by a wheel with a motor drive. The tool interface includes a square cross-section peg, equivalent to a conventional socket-wrench drive, that rotates with the wheel. The tool interface also includes a clamp that holds a tool on the peg, and a pair of fold-out cameras that provides close-up stereoscopic images of the tool and its vicinity. The field of view of the imagers is actuated by the clamp mechanism and is specific to each tool. The motor drive can power any of a variety of tools, including rotating tools for helical fasteners, drills, and such clamping tools as pliers. With the addition of a flexible coupling, it could also power another tool or remote manipulator at a short distance. The socket drive can provide very high torque and power because it is driven by the wheel motor.

*This work was done by Jaret Matthews, Norman Ahmad, and Brian Wilcox of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).  
NPO-43308*

### **Second-Generation Electronic Nose**

A report discusses the second generation of the JPL Electronic Nose (ENose), an array of 32 semi-specific chemical sensors used as an event monitor to identify and quantify contaminants released into breathing air by leaks or spills. It is designed to monitor the environment for changes in air quality, and is trained to identify and quantify selected chemical species at predetermined concentrations, ranging from sub-ppm to ppth. This system has improved reproducibility for making matched arrays, allowing use of data analysis software with minimal recalibration on sensor set replacement. The Second Generation (SG) ENose is a follow-up to the first JPL Electronic Nose that was tested on an earlier space shuttle mission (STS-95). Improvements have been made to the hardware, sensor materials, and data analysis software.

The SG ENose can be adapted to different applications and analyte sets by

selection of sensor sets. A monolithic chassis eliminates most fittings, tubing, and dead space, improving the flow system. The SG ENose also includes humidity and temperature sensors in the sensing chamber for improved event deconvolution. The design allows simple and rapid change-out of sensor sets and of filter material. All surfaces exposed to analyte are made of inert materials, and the unit is small enough to be handheld.

*This work was done by Margie Homer, Shiao-Pin Yen, Margaret Ryan, Abhijit Shevade, Hanying Zhou, Adam Kisor, Darrell Jan, April Jewell, Charles Taylor, Allison Manfreda, and Kenneth Manatt of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).*

*In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:*

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